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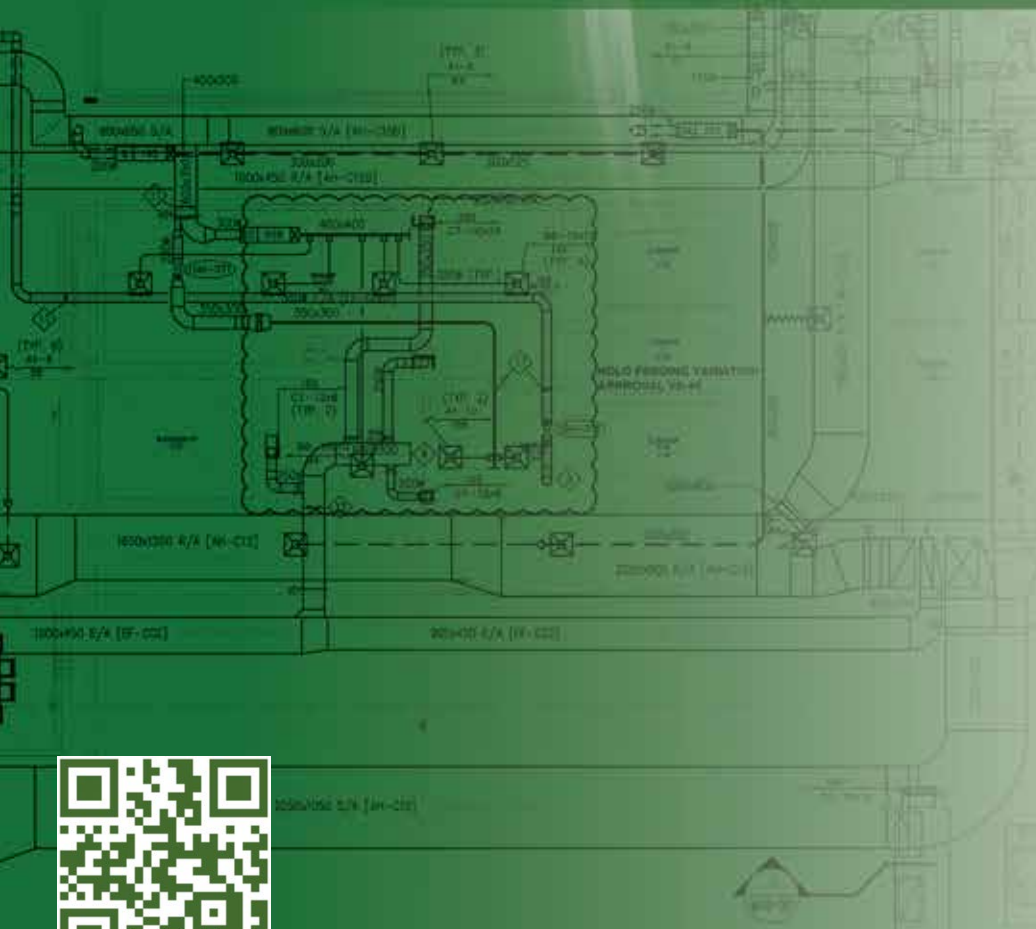
ENGINEERING FORMULAE & INDEX



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PRESSURE MEASUREMENT

Pressure Measurement

Concepts of pressure. Pressure is force per unit area. This may also be defined as energy per unit volume of fluid. There are three categories of pressure — Total Pressure, Static Pressure and Velocity Pressure that are associated with air handling. Unit of pressure is expressed in inches of water, designated **in. w.g.**

Static Pressure is the normal force per unit area at a small hole in the wall of a duct or other boundaries. It is a function of air density and degree of compression. It may be thought of as the pressure in a tire or in a tank; extends in all directions.

Velocity Pressure is the force per unit area capable of causing an equivalent velocity in moving air. Velocity pressure is a function of air density and velocity. At standard air density, the relationship between velocity pressure and velocity is expressed in the following formula:

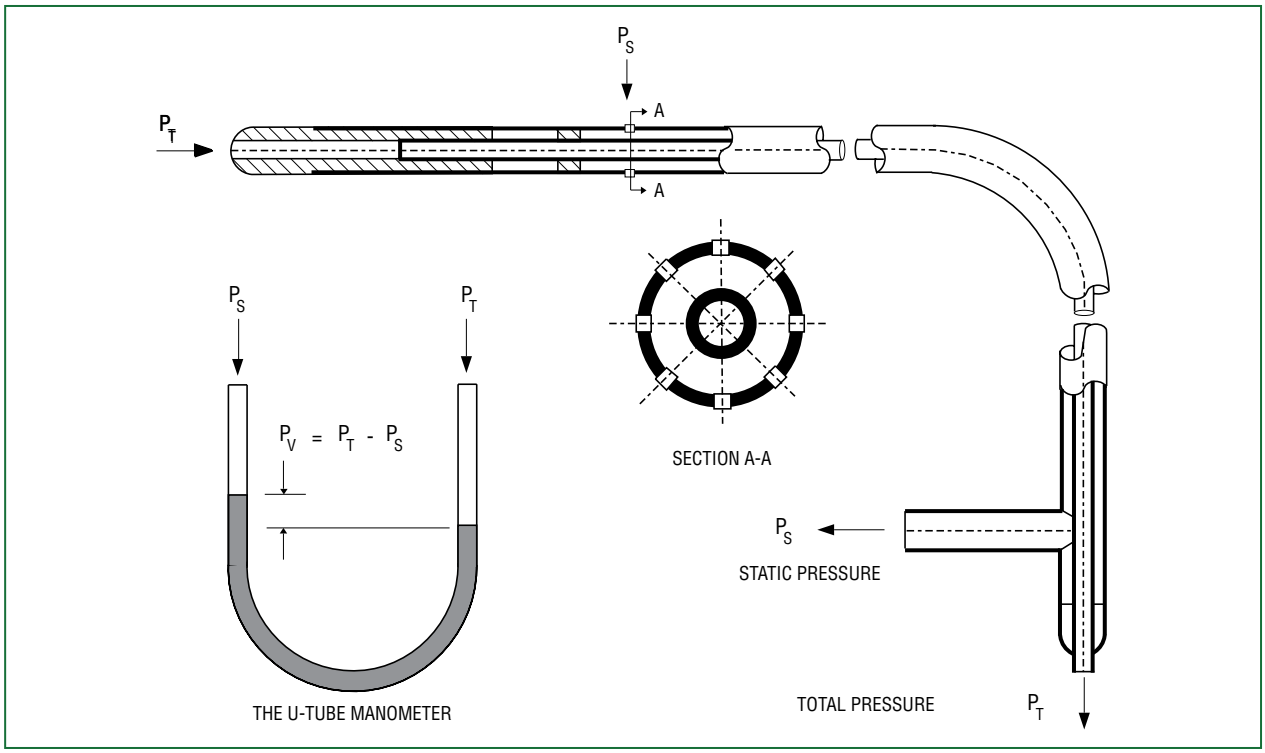
$$Pv = \left(\frac{V}{4005}\right)^2 \text{ or } V = 4005\sqrt{Pv}$$

Where: V = Air Velocity (FPM)
Pv = Velocity Pressure (in. w.g.)

Total Pressure, as its name implies, is the sum of static pressure and velocity pressure.

The Pitot Static Tube is an instrument used to measure pressure and velocities as illustrated below. It is constructed of two tubes. The inner, or impact, tube senses the total pressure as the impact opening faces upstream. The outer tube senses only the static pressure, which communicates with the airstream through small holes in its wall.

The V-Tube Manometer connects both parts of the Pitot static tube. The manometer functions as a subtracting device to give a reading of velocity pressure.



VELOCITY PRESSURE CONVERSION CHART

CONVERSION CHART for converting *VELOCITY PRESSURE* in inches of water to *VELOCITY* in feet per minute

Note: This chart is based upon standard air conditions of 70° Fahrenheit and 29.92 inches of mercury (barometric pressure), and assumes that the airflow is essentially non-compressible (under 10 inches of water pressure); as reflected by the following formula.

$$\text{Velocity (fpm)} = 4005 \sqrt{\text{Velocity Pressure in inches of water}}$$

VP	V	VP	V	VP	V	VP	V	VP	V	VP	V	VP	V	VP	V	VP	V	VP	V	VP	V
.001"	127	.062"	996	.123"	1404	.184"	1718	.245"	1982	.306"	2215	.367"	2426	.77"	3514	1.38"	4705	1.99"	5651	2.60"	6458
.002"	179	.063"	1004	.124"	1410	.185"	1723	.246"	1987	.307"	2219	.368"	2429	.78"	3537	1.39"	4722	2.00"	5664	2.61"	6470
.003"	219	.064"	1012	.125"	1416	.186"	1727	.247"	1991	.308"	2223	.369"	2433	.79"	3560	1.40"	4739	2.01"	5678	2.62"	6482
.004"	253	.065"	1020	.126"	1422	.187"	1732	.248"	1995	.309"	2226	.370"	2436	.80"	3582	1.41"	4756	2.02"	5692	2.63"	6495
.005"	283	.066"	1029	.127"	1427	.188"	1737	.249"	1999	.310"	2230	.371"	2439	.81"	3604	1.42"	4773	2.03"	5706	2.64"	6507
.006"	310	.067"	1037	.128"	1433	.189"	1741	.250"	2003	.311"	2233	.372"	2443	.82"	3625	1.43"	4790	2.04"	5720	2.65"	6519
.007"	335	.068"	1045	.129"	1439	.190"	1746	.251"	2007	.312"	2236	.373"	2445	.83"	3657	1.44"	4806	2.05"	5734	2.66"	6532
.008"	358	.069"	1052	.130"	1444	.191"	1750	.252"	2011	.313"	2239	.374"	2449	.84"	3669	1.45"	4823	2.06"	5748	2.67"	6544
.009"	380	.070"	1060	.131"	1449	.192"	1755	.253"	2015	.314"	2242	.375"	2453	.85"	3690	1.46"	4840	2.07"	5762	2.68"	6556
.010"	400	.071"	1067	.132"	1455	.193"	1759	.254"	2019	.315"	2245	.376"	2456	.86"	3709	1.47"	4856	2.08"	5776	2.69"	6569
.011"	420	.072"	1075	.133"	1461	.194"	1764	.255"	2023	.316"	2248	.377"	2459	.87"	3729	1.48"	4873	2.09"	5790	2.70"	6581
.012"	439	.073"	1082	.134"	1466	.195"	1768	.256"	2027	.317"	2251	.378"	2462	.88"	3758	1.49"	4889	2.10"	5804	2.71"	6593
.013"	457	.074"	1089	.135"	1471	.196"	1773	.257"	2031	.318"	2254	.379"	2466	.89"	3779	1.50"	4905	2.11"	5817	2.72"	6605
.014"	474	.075"	1097	.136"	1477	.197"	1777	.258"	2035	.319"	2257	.380"	2469	.90"	3800	1.51"	4921	2.12"	5831	2.73"	6617
.015"	491	.076"	1104	.137"	1482	.198"	1782	.259"	2039	.320"	2260	.381"	2472	.91"	3821	1.52"	4938	2.13"	5845	2.74"	6629
.016"	507	.077"	1111	.138"	1488	.199"	1787	.260"	2042	.321"	2264	.382"	2475	.92"	3842	1.53"	4954	2.14"	5859	2.75"	6641
.017"	522	.078"	1119	.139"	1493	.200"	1791	.261"	2046	.322"	2268	.383"	2479	.93"	3863	1.54"	4970	2.15"	5872	2.76"	6654
.018"	537	.079"	1125	.140"	1498	.201"	1795	.262"	2050	.323"	2272	.384"	2481	.94"	3884	1.55"	4986	2.16"	5886	2.77"	6666
.019"	552	.080"	1133	.141"	1504	.202"	1800	.263"	2054	.324"	2276	.385"	2485	.95"	3904	1.56"	5002	2.17"	5899	2.78"	6678
.020"	566	.081"	1140	.142"	1509	.203"	1804	.264"	2058	.325"	2280	.386"	2488	.96"	3924	1.57"	5018	2.18"	5913	2.79"	6690
.021"	580	.082"	1147	.143"	1515	.204"	1809	.265"	2062	.326"	2284	.387"	2491	.97"	3945	1.58"	5034	2.19"	5927	2.80"	6702
.022"	594	.083"	1154	.144"	1520	.205"	1813	.266"	2066	.327"	2289	.388"	2495	.98"	3965	1.59"	5050	2.20"	5940	2.81"	6714
.023"	607	.084"	1161	.145"	1525	.206"	1818	.267"	2070	.328"	2293	.389"	2499	.99"	3985	1.60"	5066	2.21"	5954	2.82"	6725
.024"	620	.085"	1167	.146"	1530	.207"	1822	.268"	2074	.329"	2297	.390"	2501	1.00"	4005	1.61"	5082	2.22"	5967	2.83"	6737
.025"	633	.086"	1175	.147"	1536	.208"	1827	.269"	2078	.330"	2301	.40"	2533	1.01"	4025	1.62"	5098	2.23"	5981	2.84"	6749
.026"	645	.087"	1181	.148"	1541	.209"	1831	.270"	2081	.331"	2304	.41"	2563	1.02"	4045	1.63"	5114	2.24"	5994	2.85"	6761
.027"	658	.088"	1188	.149"	1546	.210"	1835	.271"	2085	.332"	2308	.42"	2595	1.03"	4064	1.64"	5129	2.25"	6008	2.86"	6773
.028"	670	.089"	1193	.150"	1551	.211"	1839	.272"	2089	.333"	2311	.43"	2626	1.04"	4084	1.65"	5144	2.26"	6021	2.87"	6785
.029"	682	.090"	1201	.151"	1556	.212"	1844	.273"	2093	.334"	2315	.44"	2656	1.05"	4103	1.66"	5160	2.27"	6034	2.88"	6797
.030"	694	.091"	1208	.152"	1561	.213"	1848	.274"	2097	.335"	2318	.45"	2687	1.06"	4123	1.67"	5175	2.28"	6047	2.89"	6809
.031"	705	.092"	1215	.153"	1567	.214"	1853	.275"	2101	.336"	2322	.46"	2716	1.07"	4142	1.68"	5191	2.29"	6060	2.90"	6820
.032"	716	.093"	1222	.154"	1572	.215"	1857	.276"	2105	.337"	2325	.47"	2746	1.08"	4162	1.69"	5206	2.30"	6074	2.91"	6832
.033"	727	.094"	1228	.155"	1577	.216"	1862	.277"	2119	.338"	2329	.48"	2775	1.09"	4181	1.70"	5222	2.31"	6087	2.92"	6844
.034"	738	.095"	1234	.156"	1582	.217"	1866	.278"	2113	.339"	2332	.49"	2804	1.10"	4200	1.71"	5237	2.32"	6100	2.93"	6855
.035"	749	.096"	1241	.157"	1587	.218"	1870	.279"	2116	.340"	2335	.50"	2832	1.11"	4219	1.72"	5253	2.33"	6113	2.94"	6867
.036"	759	.097"	1247	.158"	1592	.219"	1875	.280"	2119	.341"	2338	.51"	2860	1.12"	4238	1.73"	5268	2.34"	6126	2.95"	6879
.037"	770	.098"	1254	.159"	1597	.220"	1879	.281"	2123	.342"	2342	.52"	2888	1.13"	4257	1.74"	5283	2.35"	6139	2.96"	6890
.038"	780	.099"	1260	.160"	1602	.221"	1883	.282"	2127	.343"	2345	.53"	2916	1.14"	4276	1.75"	5298	2.36"	6152	2.97"	6902
.039"	791	.100"	1266	.161"	1607	.222"	1887	.283"	2131	.344"	2349	.54"	2943	1.15"	4295	1.76"	5313	2.37"	6165	2.98"	6913
.040"	801	.101"	1273	.162"	1612	.223"	1892	.284"	2135	.345"	2352	.55"	2970	1.16"	4314	1.77"	5328	2.38"	6179	2.99"	6925
.041"	811	.102"	1279	.163"	1617	.224"	1896	.285"	2139	.346"	2356	.56"	2997	1.17"	4332	1.78"	5343	2.39"	6191	3.00"	6937
.042"	821	.103"	1285	.164"	1622	.225"	1900	.286"	2143	.347"	2360	.57"	3024	1.18"	4350	1.79"	5359	2.40"	6204	3.01"	6948
.043"	831	.104"	1292	.165"	1627	.226"	1905	.287"	2147	.348"	2363	.58"	3050	1.19"	4368	1.80"	5374	2.41"	6217	3.02"	6960
.044"	840	.105"	1298	.166"	1632	.227"	1909	.288"	2151	.349"	2366	.59"	3076	1.20"	4386	1.81"	5388	2.42"	6230	3.03"	6971
.045"	849	.106"	1304	.167"	1637	.228"	1913	.289"	2154	.350"	2369	.60"	3102	1.21"	4405	1.82"	5403	2.43"	6243	3.04"	6983
.046"	859	.107"	1310	.168"	1642	.229"	1917	.290"	2157	.351"	2372	.61"	3127	1.22"	4423	1.83"	5418	2.44"	6256	3.05"	6994
.047"	868	.108"	1316	.169"	1646	.230"	1921	.291"	2161	.352"	2376	.62"	3153	1.23"	4442	1.84"	5433	2.45"	6269	3.06"	7006
.048"	877	.109"	1322	.170"	1651	.231"	1925	.292"	2164	.353"	2379	.63"	3179	1.24"	4460	1.85"	5447	2.46"	6281	3.07"	7017
.049"	887	.110"	1328	.171"	1656	.232"	1929	.293"	2168	.354"	2383	.64"	3204	1.25"	4478	1.86"	5462	2.47"	6294	3.08"	7028
.050"	896	.111"	1334	.172"	1661	.233"	1933	.294"	2171	.355"	2386	.65"	3229	1.26"	4495	1.87"	5477	2.48"	6307	3.09"	7040
.051"	904	.112"	1340	.173"	1666	.234"	1937	.295"	2175	.356"	2389	.66"	3254	1.27"	4513	1.88"	5491	2.49"	6319	3.10"	7051
.052"	913	.113"	1346	.174"	1670	.235"	1941	.296"	2179	.357"	2393	.67"	3279	1.28"	4531	1.89"	5506	2.50"	6332	3.11"	7063
.053"	922	.114"	1352	.175"	1675	.236"	1945	.297"	2182	.358"	2396	.68"	3303	1.29"	4549	1.90"	5521	2.51"	6345	3.12"	7074
.054"	931	.115"	1358	.176"	1680	.237"	1950	.298"	2186	.359"	2400	.69"	3327	1.30"	4566	1.91"	5535	2.52"	6358	3.13"	7085
.055"	939	.116"	1364	.177"	1685	.238"	1954	.299"	2189	.360"	2403	.70"	3351	1.31"	4583	1.92"	5550	2.53"	6370	3.14"	7097
.056"	948	.117"	1370	.178"	1690	.239"	1958	.300"	2193	.361"	2406	.71"	3375	1.32"	4601	1.93"	5564	2.54"	6383	3.15"	7108
.057"	956	.118"	1376	.179"	1695	.240"	1962	.301"	2197	.362"	2410	.72"	3398	1.33"	4619	1.94"	5579	2.55"	6395	3.16"	7119
.058"	964	.119"	1382	.180"	1699	.241"	1966	.302"	2200	.363"	2413	.73"	3422	1.34"	4636	1.95"	5593	2.56"	6408	3.17"	7131
.059"	973	.120"	1387	.181"	1704	.242"	1970	.303"	2204	.364"	2416	.74"	3445	1.35"	4653	1.96"	5608	2.57"	6420	3.18"	7142
.060"	981	.121"	1393	.182"	1709	.243"	1974	.304"	2208	.365"	2420	.75"	3468	1.36"	4671	1.97"	5623	2.58"	6433	3.19"	7153
.061"	989	.122"	1399	.183"	1713	.244"	1978	.305"	2212	.366"	2423	.76"	3491	1.37"	4688	1.98"	5637	2.59"	6445	3.20"	7164

MISCELLANEOUS

Equivalent Measures of Pressure

1 lb. per square inch	=	144 lbs. per sq. ft. 2.036 in. Mercury at 32°F. 2.311 ft. Water at 70°F. 27.74 in. Water at 70°F.
1 ounce per square inch	=	1272 in. Mercury at 32°F. 1.733 in. Water at 70°F.
1 Atmosphere	=	14.696 lbs. per sq. in. 2116.3 lbs. per sq. ft. 33.96 ft. Water at 70°F. 29.92 in. Mercury at 32°F.
1 inch Water at 70°F	=	.03609 lb. per sq. in. .5774 oz. per sq. in. 5.196 lbs. per sq. ft.
1 foot Water at 70°F	=	.433 lbs. per sq. in. 62.31 lbs. sq. ft.
1 inch Mercury at 32°F	=	.491 lbs. per sq. in. 7.86 oz. per sq. in. 1.136 ft. Water at 70°F. 13.63 in. Water at 70°F.

Sheet Metal Thickness (Inches) and Weight (Lbs./Sq. Ft.)

Gauge NO.	Steel		Galvanized Steel		Aluminum	
	Thickness	Weight	Thickness	Weight	Thickness	Weight
3	.2391	10.000			.2294	3.23
4	.2242	9.375			.2043	2.88
5	.2092	8.750			.1819	2.56
6	.1943	8.125			.1620	2.29
7	.1793	7.500			.1443	2.04
8	.1644	6.875	.1681	7.031	.1285	1.81
9	.1495	6.250	.1532	6.406	.1144	1.61
10	.1345	5.625	.1382	5.781	.1019	1.44
11	.1196	5.000	.1233	5.156	.0907	1.28
12	.1046	4.375	.1084	4.531	.0808	1.14
13	.0897	3.750	.0934	3.906	.0720	1.02
14	.0747	3.125	.0785	3.281	.0641	.905
15	.0673	2.812	.0710	2.969	.0571	.806
16	.0598	2.500	.0635	2.656	.0508	.717
17	.0538	2.250	.0575	2.406	.0453	.639
18	.0478	2.000	.0516	2.156	.0403	.569
19	.0418	1.750	.0456	1.906	.0359	.507
20	.0359	1.500	.0396	1.656	.0320	.452
21	.0329	1.375	.0366	1.531	.0285	.402
22	.0299	1.250	.0336	1.406	.0254	.357
23	.0269	1.125	.0306	1.281	.0226	.319
24	.0239	1.000	.0276	1.156	.0201	.284
25	.0209	.875	.0247	1.031	.0179	.253
26	.0179	.750	.0217	.906	.0159	.224
27	.0164	.688	.0202	.844	.0142	.200
28	.0149	.625	.0187	.781	.0126	.178
29	.0135	.562	.0172	.719	.0113	.159
30	.0120	.500	.0157	.656	.0100	.141
31	.0105	.438	.0142	.594	.0089	.126
32	.0097	.406	.0134	.563	.0080	.113

† Steel – U.S. Standard (Revised)
Galvanized – Galvanized Gauge No.
Aluminum – American Gauge and Brown & Sharpe

Round Duct Area and Circumference

Dia. In Inches	Area Sq. Ft.	Circum. Inches	Dia. In Inches	Area Sq. Ft.	Circum. Inches
1	.00545	3.142	26	3.687	81.68
2	.0218	6.283	27	3.976	84.82
3	.0491	9.425	28	4.276	87.96
4	.0873	12.57	29	4.587	91.11
5	.1364	15.71	30	4.909	94.25
6	.1963	18.85	31	5.241	97.39
7	.2673	21.99	32	5.585	100.5
8	.3491	25.13	33	5.940	103.7
9	.4418	28.27	34	6.305	106.8
10	.5454	31.42	35	6.681	110.0
11	.6600	34.56	36	7.069	113.1
12	.7854	37.70	37	7.467	116.2
13	.9218	40.84	38	7.876	119.4
14	1.069	43.98	39	8.296	122.5
15	1.227	47.12	40	8.727	125.7
16	1.396	50.27	41	9.168	128.8
17	1.576	53.41	42	9.621	131.9
18	1.767	56.55	43	10.08	135.1
19	1.969	59.69	44	10.56	138.2
20	2.182	62.83	45	11.04	141.4
21	2.405	65.97	46	11.54	144.5
22	2.640	69.12	47	12.05	147.7
23	2.885	72.26	48	12.57	150.8
24	3.142	75.40	49	13.09	153.9
25	3.409	78.54	50	13.64	157.1

MISCELLANEOUS

Common Fractions Reduced to Decimals

8ths	16ths	32ds	64ths		8ths	16ths	32ds	64ths		8ths	16ths	32ds	64ths	
			1	.015625				23	.359375				45	.703125
		1	2	.03125	3	6	12	24	.375			23	46	.71875
			3	.046875				25	.390625				47	.734375
	1	2	4	.0625			13	26	.40625	6	12	24	48	.75
			5	.078125				27	.421875				49	.765625
		3	6	.09375		7	14	28	.4375			25	50	.78125
			7	.109375				29	.453125				51	.796875
1	2	4	8	.125			15	30	.46875		13	26	52	.8125
			9	.140625				31	.484375				53	.828125
		5	10	.15625	4	8	16	32	.5			27	54	.84375
			11	.171875				33	.515625				55	.859375
	3	6	12	.1875			17	34	.53125	7	14	28	56	.875
			13	.203125				35	.546875				57	.890625
		7	14	.21875		9	18	36	.5625			29	58	.90625
			15	.234375				37	.578125				59	.921875
2	4	8	16	.25			19	38	.59375		15	30	60	.9375
			17	.265625				39	.609375				61	.953125
		9	18	.28125	5	10	20	40	.625			31	62	.96875
			19	.296875				41	.640625				63	.984375
	5	10	20	.3125			21	42	.65625	8	16	32	64	1.
			21	.328125				43	.671875					
		11	22	.34375		11	22	44	.6875					

Mathematical Formulae

To find the CIRCUMFERENCE of a:

Circle — Multiply the diameter by 3.14159265 (usually 3.1416).

To find the AREA of a:

Circle — Multiply the square of the diameter by .785398 (usually .7854).
Rectangle — Multiply the length of the base by the height.
Sphere (surface) — Multiply the square of the radius by 3.1416 and multiply by 4.
Square — Square the length of one side.
Trapezoid — Add the two parallel sides, multiply by the height and divide by 2.
Triangle — Multiply the base by the height and divide by 2.

To find the VOLUME of a:

Cone — Multiply the square of the radius of the base by 3.1416, multiply by the height, and divide by 3.
Cube — Cube the length of one edge.
Cylinder — Multiply the square of the radius of the base by 3.1416 and multiply by the height.
Pyramid — Multiply the area of the base by the height and divide by 3.
Rectangular Prism — Multiply the length by the width by the height.
Sphere — Multiply the cube of the radius by 3.1416, multiply by 4 and divide by 3.

MISCELLANEOUS

Definitions and Formulae

CFM = Cubic Feet per Minute
FPM = Feet per Minute (Velocity)
Ak = Area Factor Expressed in Square Feet
TP = Total Pressure Expressed in Inches of Water
SP = Static Pressure Expressed in Inches of Water
VP = Velocity Pressure Expressed in Inches of Water
VP = $(FPM \div 4005)^2$
ΔP = Differential Pressure
ΔP_S = Static Differential Pressure
ΔP_T = Total Differential Pressure

$CFM = FPM \times Ak$
$FPM = CFM \div Ak$
$VP = TP - SP$
$TP = SP + VP$
$SP = TP - VP$
$\Delta P_T = TP_1 - TP_2$
$\Delta P_S = SP_1 - SP_2$

Measures of Force and Pressure

Dyne = force necessary to accelerate a 1-gram mass 1 centimeter per second squared = 0.000072 poundal.

Poundal = force necessary to accelerate a 1-pound mass 1 foot per second squared = 13,825.5 dynes = 0.138255 newtons.

Newton = force needed to accelerate a 1-kilogram mass 1 meter per second squared.

Pascal (pressure) = 1 newton per square meter = 0.020885 pound per square foot.

Atmosphere (air pressure at sea level) = 2,116.102 pounds per square foot = 14.6952 pounds per square inch = 1.0332 kilograms per square centimeter = 101,323 newtons per square meter.

METRIC CONVERSION

Metric Guide Conversion Factors

Quantity	Imperial Unit	Metric Unit		From Imperial To Metric Multiply By:	From Metric To Imperial Multiply By:
Area	square foot	square meter	(m^2)	0.0929	10.764
	square inch	square millimeter	(mm^2)	645.16	.00155
Density	pounds per cubic foot	kilograms per cubic meter	(kg/M^3)	16.018	.0624
Energy	British thermal unit (BTU)	joule	(J)	1055.056	.000948
	kilowatt hour	megajoule	(MJ)	3.6	.2778
	watts per second	joule	(J)	1	1
	horsepower hour	megajoule	(MJ)	2.6845	.3725
Force	ounce force	newton	(N)	.278	3.597
	pound force	newton	(N)	4.4482	.2248
	kilogram force	newton	(N)	9.8067	.102
Heat	BTU per hour	watt	(W)	.2931	3.412
	BTU per pound	joules per kilogram	(J/kg)	2326	.00043
Length	inch	millimeter	(mm)	25.4	.0394
	foot	millimeter	(mm)	304.8	.00328
	foot	meter	(m)	.3048	3.2808
	yard	meter	(m)	.9144	1.0936
Mass (weight)	ounce (avoirdupois)	gram	(g)	28.35	.0353
	pound (avoirdupois)	kilogram	(kg)	.4536	2.2046
Power	horsepower	kilowatt	(kW)	.7457	1.341
	horsepower (boiler)	kilowatt	(kW)	9.8095	.1019
	foot pound - force per minute	watt	(W)	.0226	44.254
	ton of refrigeration	kilowatt	(kW)	3.517	.2843
Pressure	inch of water column	kilopascal	(kPa)	.2486	4.0219
	foot of water column	kilopascal	(kPa)	2.9837	.3352
	inch of mercury column	kilopascal	(kPa)	3.3741	.2964
	ounces per square inch	kilopascal	(kPa)	.4309	2.3206
	pounds per square inch	kilopascal	(kPa)	6.8948	.145
Temperature	Fahrenheit	Celsius	(°C)	5/9(°F-32)	(9/5°C)+32
Torque	ounce - force inch	millinewton-meter	(mN.m)	7.0616	.1416
	pound - force inch	newton-meter	(N.m)	.113	8.8495
	pound - force foot	newton-meter	(N.m)	1.3558	.7376
Velocity	feet per second	meters per second	(m/s)	.3048	3.2808
	feet per minute	meters per second	(m/s)	.00508	196.85
	miles per hour	meters per second	(m/s)	.44704	2.2369
Volume (capacity)	cubic foot	liter	(l)	28.3168	.03531
	cubic inch	cubic centimeter	(cm^2)	16.3871	.06102
	cubic yard	cubic meter	(m^3)	.7646	1.308
	gallon (U.S.)	liter	(l)	3.785	.2642
	gallon (imperial)	liter	(l)	4.546	.212
Volume (flow)	cubic feet per minute (cfm)	liters per second	(l/s)	.4719	2.119
	cubic feet per minute (cfm)	cubic meters per second	(m^3/s)	.0004719	2119
	cubic feet per hour (cfh)	milliliters per second	(ml/s)	7.8658	.127133
	gallons per minute (U.S.)	liters per second	(l/s)	.06309	15.85
	gallons per minute (imperial)	liters per second	(l/s)	0.07577	13.198

PRODUCT & SYSTEM CAPABILITIES OVERVIEW

This page highlights a range of HVAC and innovative building solutions available through **Saturn Enterprises, Inc.** and our trusted partners. These industry-leading product lines are engineered, tested, and certified in accordance with applicable HVAC codes and performance standards, including UL, AMCA, AHRI, ASHRAE, and other recognized industry requirements, supporting a wide range of project applications.

Air Distribution Products (GRD)

A broad range of architectural and commercial air distribution products is available, including slot diffusers, square plaque diffusers, spiral duct grilles, heavy-duty registers, and specialty solutions. Products are designed to integrate with modern architectural spaces while delivering consistent, tested airflow performance.

Dampers

Damper solutions include airflow control dampers for system balancing and modulation, as well as fire and fire/smoke dampers for life-safety applications. Products are tested and certified in accordance with applicable UL and industry standards, supporting code compliance, system reliability, and occupant protection.

Louvers

High-performance louvers are offered in standard and custom configurations using extruded aluminum or formed steel construction. Products are AMCA-certified and tested for airflow performance, water penetration, wind-driven rain resistance, and structural integrity.

Critical Environment Solutions

Solutions for operating rooms, laboratories, cleanrooms, and controlled environments include laminar flow diffusers, fan filter units, and precision air delivery products. Designs support stringent airflow, cleanliness, and environmental control requirements and are validated through recognized testing standards.

Air Terminal Units

Air terminal units provide accurate zone-level airflow control to support occupant comfort and system efficiency. Products are engineered and tested to meet applicable performance and acoustic standards.

Underfloor Air Distribution (UFAD)

Underfloor air distribution products include swirl and linear diffusers, fan-powered boxes, fan boosters, and underfloor fan coil units. Systems are tested to deliver reliable performance in raised-floor applications.

Displacement Diffusers

Displacement diffusers combine architectural design with proven low-velocity air distribution performance. Products are supported by laboratory testing and computational analysis to promote effective air stratification and indoor environmental quality.

Electric Duct Heaters

Electric duct heaters are available in a wide range of capacities with control options from staged control to advanced SCR systems. Products are tested and certified to applicable UL and safety standards.

Acoustical Control Solutions

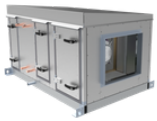
Air duct silencers are designed to reduce HVAC-related noise while maintaining airflow performance. Products are tested to recognized acoustic and performance standards.

Fan Coil Units

Fan coil systems serve hospitality, healthcare, education, public, and commercial markets. Units are designed for reliable operation, efficiency, and long service life.

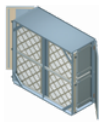
Water Source Heat Pumps

Water source heat pumps provide efficient heating and cooling using water as the heat transfer medium. Units are available in horizontal, vertical, and stacked configurations and are tested to applicable performance and safety standards.



Custom Air Handling Units

Custom air handling units are available in horizontal and vertical configurations with multiple mounting and installation options. Design, testing, and performance are governed by recognized organizations including UL, ETL, AHRI, AMCA, and DOE.



Filtration & Air Cleaning Systems

Industrial-grade filtration and air cleaning solutions include standard, flat, and double-flat filter housings; HEPA and carbon filter housings; V-bank filter units; and fan pack filter systems. Products are designed to control particulate, gas-phase, and bioaerosol contaminants and are tested to applicable industry standards.

Building Automation & Controls

Building automation and control solutions support efficient HVAC operation, integrated lighting control, and coordination with other building systems. Open, interoperable platforms enable real-time monitoring and control while supporting security while meeting federal cybersecurity requirements.